The effect of deprivation on variations in general practitioners' referral rates: a cross sectional study of computerised data on new medical and surgical outpatient referrals in Nottinghamshire

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Abstract

Objective: To determine the effect of deprivation on variations in general practitioners' referral rates using the Jarman underprivileged area (UPA(8)) score as a proxy measure.

Design: Cross sectional survey of new medical and surgical referrals from general practices to hospitals (determined from hospital activity data).

Setting: All of the 183 general practices in Nottinghamshire and all of the 19 hospitals in Trent region.

Main outcome measures: The relation between the referral rates per 1000 registered patients and the practice population's UPA(8) score (calculated on the basis of electoral ward), with adjustment for the number of partners, percentage of patients aged over 65 years, and fundholding status of each practice.

Results: There was a significant independent association between deprivation, as measured by the UPA(8) score, and high total referral rates and high medical referral rates ($P < 0.0001$). The UPA(8) score alone explained 23% of the total variation in total referral rates and 32% of the variation in medical referral rates. On multivariate analysis, where partnership size, fundholding status, and percentage of men and women aged over 65 years were included, the UPA(8) score explained 29% and 35% of the variation in total and medical referral rates respectively.

Conclusion: Of the variables studied, the UPA(8) score was the strongest predictor of variations in referral rates. This association is most likely to be through a link with morbidity, although it could reflect differences in patients' perceptions, doctors' behaviour, or the use and provision of services.

Introduction

Many studies have failed to explain the 25-fold variation in general practitioners' referral rates.[1] Much of this research has been motivated by the considerable cost of referrals to secondary care, rather than the effect of referrals on primary care services. Some researchers have examined whether wide variations are due to characteristics of the referring doctors[2 3] or organisational factors in individual practices.[4-7] Although referral rates vary with patients' ages[8 9] the differences in age-sex mix in practices are insufficient to explain much of the variation.[4 10] Although case-mix can influence referral rates among individual doctors,[11 12] little work has been done on the effect of the demographic characteristics of practice populations on referral rates. Although social class and deprivation have been linked to mortality[13 14] and morbidity,[15-22] the relation between all of these factors—at a practice population level—and referral rates remains unclear. Some studies have shown that patients from higher social classes are more likely to be referred,[4 10 23] whereas others have shown either the opposite[24 25] or no clear pattern,[26] particularly when the data are adjusted for consultation rates.[27]

We explored the relation between variations in referral rates and deprivation of practice populations using the Jarman underprivileged area (UPA(8)) score[28 29] as a proxy measure for deprivation.

Method

We obtained approval from the local ethics committee. The relevant health authorities provided a database of characteristics of all of the 183 general practices in Nottinghamshire for 1993. This contained data on list size, age-sex structure, number of partners, fundholding status, and UPA(8) score. The UPA(8) score had been calculated using a weighted average of the percentage of registered patients in each practice according to the electoral wards in which they lived.

We constructed a database of referrals using minimum datasets from all of the 19 provider units—that is, hospitals—throughout the Trent region. These hospitals received most of the referrals from Nottinghamshire practices during 1993. We included all first outpatient referrals to medical and surgical specialties. We linked the total number of new medical and surgical referrals from each practice in 1993 to the practice identification code and then to the database of practice characteristics. We calculated the total, medical, and surgical referral rates per 1000 registered patients. We coded the practices according to

Table 1 Number of referrals per 1000 patients and underprivileged area (UPA(8)) scores of 183 general practices in Trent region in 1993

	No of practices with data available	Mean (SD)	Range
Total referral rate	181	215.4 (67.9)	83.5-533.0
Medical referral rate	177	133.9 (67.8)	32.5-454.5
Surgical referral rate	179	81.4 (33.1)	5.6-247.8
UPA(8) score	174	7.5 (15.7)	–22.6-40.5

fundholding status and partnership size—that is, singlehanded general practitioner or not—in 1993.

We aimed to identify the characteristics of the practices that best explain variation in referral rates. Initially the association between each of the practice characteristics and total, medical, and surgical referral rates was determined by linear regression. We standardised for age and sex by including the percentage of men aged over 65 years and of women aged over 65 years in each practice as a variable in the regression equation. We could not standardise for age and sex for 10 year age groups as the data were unavailable. We used multiple linear regression to examine the contribution of each of these variables in relation to each other by including all the variables in the analysis simultaneously. The mean referral rates, as estimated by the fitted regression lines, were then calculated. A two sided significance level of 0.01 was used. All the data were analysed with SPSS for windows (version 6.0).

Results

Of the 183 Nottinghamshire practices, 22 were fundholding and 54 singlehanded. We excluded data for two practices as partnership changes made the data unreliable. Table 1 shows the referral rates and UPA(8) scores associated with the practices. The data for total, medical, and surgical referral rates were normally distributed and were therefore suitable for multiple regression analysis without transformation.

Relation between referral rates and UPA(8) scores

The practices with high UPA(8) scores—that is, relatively deprived—had high total referral rates ($P<0.0001$; $R^2=23\%$) and medical referral rates ($P<0.0001$; $R^2=32\%$) (table 2). By comparison, increasing deprivation was less associated with decreasing surgical referral rates ($P=0.04$), and only 2.3% of the total variation in surgical referral rates was explained.

Table 3 shows that the associations between UPA(8) and each category of referral rates persisted after the data had been adjusted for the percentage of men and women aged over 65 years, fundholding status, and number of partners. The multivariate models for total and medical referral rates had an adjusted R^2 value of 29% and 35% respectively, and UPA(8) was the strongest predictor of referral rates compared with other practice characteristics used in this analysis.

Singlehanded practices and referral rates

Table 2 shows the relation between singlehanded practices and referral rates when the effect of partnership size is examined in isolation. Singlehanded practices had significantly higher mean total referrals per 1000 registered patients (241 *v* 202; $P=0.0003$) and medical referrals (159 *v* 123; $P=0.002$) than larger practices. There was no difference between the mean surgical referral rates of singlehanded practices and larger practices (83 *v* 79; $P=0.44$). When other variables were included, the association between singlehanded practice and high total referral rates persisted (table 3).

Fundholding status and referral rates

In the univariate analysis (table 2), the mean total referral rate was significantly lower for fundholding practices than for non-fundholding practices (174 *v* 221; $P=0.002$). The mean medical referral rate was also lower for fundholding practices than for non-fundholding practices (91 *v* 140; $P=0.002$). There was no association for surgical referral rates (82 *v* 81; $P=0.89$). These associations become borderline, however, when other factors were included in the analysis (table 3).

Discussion

Deprivation, as measured by the UPA(8) score, was significantly associated with high total referral rates and high medical referral rates. The UPA(8) score alone

Table 2 Univariate analysis for total, medical, and surgical referral rates and general practice characteristics

Variable	R^2 (%)	Constant	B coefficient (95% CI)	P value
Total referral rates				
UPA(8) score	22.9	201.1	2.1 (1.5 to 2.7)	<0.0001
Singlehanded GP*	7.2	202.7	38.7 (18.1 to 59.6)	0.0003
Fundholder**	5.2	221.1	–47.3 (–77.1 to –17.50)	0.002
Medical referral rates				
UPA(8) score	31.8	117.6	2.5 (1.9 to 3.0)	<0.0001
Singlehanded GP*	5.6	123.4	35.3 (13.6 to 57.0)	0.002
Fundholder**	5.6	140.0	–48.5 (–78.2 to –18.8)	0.002
Surgical referral rate				
UPA(8) score	2.3	83.7	–0.3 (–0.6 to –0.01)	0.04
Singlehanded GP*	0.3	79.3	3.9 (–6.1 to 13.9)	0.44
Fundholder**	0.0	81.3	1.1 (–13.8 to 16.0)	0.89

CI=confidence interval; UPA(8)=underprivileged area; GP=general practitioner.
*Relative to a baseline of practices with more than one doctor.
**Relative to a baseline of non-fundholding practices.

Table 3 Multivariate associations between total referral rates, medical referral rates, and surgical referral rates and characteristics of referring practice

Model*	Adjusted B coefficient (95% CI)	P value
Total referral rates		
UPA(8) score	2.0 (1.4 to 2.5)	<0.0001
Singlehanded GP**	25.7 (6.8 to 44.6)	0.008
Fundholding status***	–27.0 (–53.0 to –1.0)	0.04
Adjusted R^2=29.2%; constant=186.4; F=15.08; 2 df; P<0.0001		
Medical referral rates		
UPA(8) score	2.3 (1.8 to 2.9)	<0.0001
Singlehanded GP**	19.9 (1.0 to 38.8)	0.04
Fundholding status***	–28.5 (–54.3 to –2.8)	0.03
Adjusted R^2=34.8%; constant=109.3; F=18.71; 2 df; P<0.0001		
Surgical referral rates		
UPA(8) score	–0.3 (–0.6 to 0.0)	0.05
Singlehanded GP**	6.8 (–3.5 to 17.1)	0.20
Fundholding status***	1.5 (–12.6 to 15.6)	0.84
Adjusted R^2=1.7%; constant=78.0; F=1.58; 2 df; P=0.17		

CI=confidence interval; UPA(8)=underprivileged area; GP=general practitioner.
*The percentage of men and women aged over 65 years registered with each practice has been included.
**Relative to a baseline of practices with more than one doctor.
***Relative to a baseline of non-fundholding practices.

explains 23% of the total variation in total referral rates and 32% of the variation in medical referral rates. On multivariate analysis, where partnership size, fundholding status, percentage of men and women aged over 65 years were included, the UPA(8) score explained 29% and 35% of the variation in total and medical referral rates respectively. The addition of other practice characteristics to the analysis does not therefore explain much more of the variation than the UPA(8) score alone.

The results of this study suggest that the practice based UPA(8) score is a strong predictor of total and medical referral rates. Although we used a different measure of deprivation (that is, UPA(8)) and a different outcome related to resource usage (new outpatient referrals), our results are in broad agreement with recent work showing that morbidity, workload, and drug treatments in primary care increased with decreasing socioeconomic status.[30] Our results are in contrast, however, with other studies of general practitioners' activities—for example, prescribing,[31] number of consultations, and night visits[32 33]—showing that the UPA(8) score is a relatively poor predictor of variations and thought to be an inappropriate measure for healthcare planning and distribution of resources.[34-43] The association between deprivation and high medical referral rates may simply reflect increased morbidity. Alternatively, it could be due to differences in the use or provision of services to patients from deprived areas. For example, it may be more difficult to make a diagnosis in the context of social deprivation, which then results in increased use of secondary care services. The assocation between deprivation and high total and medical referral rates may reflect differences in patients' perceptions and illness behaviour; doctors' referral behaviour; use, access, and provision of services; or any combination of these factors, which could be further exaggerated by socioeconomic factors.

In contrast with medical and total referral rates, the UPA(8) is not a strong predictor of the variations in surgical referral rates. The data collected during this study do not allow us to determine the reasons for this discrepancy. Several possible reasons, however, could be further investigated. Firstly, the discrepancy may be due to chance. Secondly, it may reflect intrinsic differences in the types of medical and surgical problems requiring referral; for example, doctors are less likely to disagree on the need for surgical referral for a suspicious lump than on the need for a medical referral for a patient with fatigue or headache. Thirdly, the discrepancy may reflect differences in underlying prevalence of surgical and medical morbidity in relation to deprivation.

Singlehanded doctors have higher total referral rates than larger practices, even when other practice characteristics—for example, fundholding status and UPA(8) score—are taken into account. This could be due to staffing levels; self selection of high referring doctors to singlehanded practices; or a lack of colleagues with whom potential referrals can be discussed. However, Madeley and colleagues did not show any significant difference in the referral rates between singlehanded general practitioners and those in partnerships.[44] Further research would be needed to confirm whether singlehanded doctors in other geographical areas, or in other years, have higher referral rates and if so, why.

Key messages

- Significant associations exist between deprivation as measured by the UPA(8) score and high total and medical referral rates
- On multivariate analysis, where partnership size, fundholding status, percentage of men and women aged over 65 years were included, the UPA(8) score explained 29% and 35% of the variation in total and medical referral rates respectively
- Of the variables studied, the UPA(8) score is the strongest predictor of variations in medical referral rates
- Studies of general practitioners' workload and activity need to include deprivation scores such as the UPA(8) score

In the univariate analysis, fundholding status has a significant effect on the total and medical referral rate. However, this association becomes much reduced on multivariate analysis. This is because fundholding practices are likely to have more partners and to be in less deprived areas. This analysis suggests that studies of the effect of fundholding status on general practice workload and activity[45-47] should include other variables, in particular the UPA(8) score and partnership size.

Although the data for outpatient referrals for this study may contain some inaccuracies, they are unlikely to have introduced significant bias into the study as poor quality data would probably have underestimated rather than overestimated the statistical coefficients.

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An unforgettable patient

Never give up trying

Paediatric medicine throws up occasionally a puzzling problem or an unexplained phenomenon which you encounter once or twice in your professional career. Mine occurred in the year I became a consultant paediatrician. I am thankful that I have not encountered a similar problem ever since.

In the summer of 1968 a general practitioner referred Jane to me—a 10 year old who, during the recent holidays abroad, developed a recurrent skin rash and joint pains. The clinical history was consistent with a diagnosis of Henoch-Schonlein purpura despite the absence of any positive physical signs. The progress during the subsequent few weeks was characterised by rapidly deteriorating renal function. Renal biopsy showed diffuse proliferative lesions. Within a number of weeks she developed the features of the nephrotic syndrome. Despite intensive dietary changes, the use of repeated courses of corticosteroids, diuretics, cyclophosphamide alone or in combination with corticosteroids and chlorambucil, Jane's critical condition continued to worsen. She resembled "the Michelin man" picture, she had gross ascites and peripheral oedema, her eyes were virtually closed due to oedema, and the mouth became a tiny aperture through which the nurses administered nutrients and fluids. A trial of heparin was recommended, but was of no therapeutic benefit. The position was desperate, and the outlook seemed grave. One day while finishing her third day course of azathioprine and corticosteroids, she developed significant diuresis and then proceeded to full remission within the next 24 days. All treatment was discontinued at 30 days.

Jane's progress up to now—that is, to the age of 27—has been entirely uneventful. At no time had she had any relapses. Three pregnancies were normal. The third child, a boy, at the age of 8 years and 4 months developed classic Henoch-Scholein purpura (diagnosed by a paediatrician elsewhere), but the child did not proceed to any renal complications, and he recovered spontaneously within a few weeks.

I have wondered many times since then as to what, if any, therapeutic action was responsible for Jane's remission. I told the parents at the time that a spontaneous remission was the most likely explanation. But the ultimate lesson I had learnt in my early professional career was not to give up trying no matter how desperate the clinical situation seemed to be. The tremendous and freely given professional help and advice I received regarding Jane's management from many experts, both in Britain and abroad, has been the most cherished and unforgettable experience. Indeed some have become my friends.

Every year Jane kindly sends me a family card which I am most pleased to receive. It reminds me that all is well and it also stirs my early memories of her illness—the most recent card has finally persuaded me to write this succinct account of Jane's medical history.

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